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January 27, 2003

RECEIVED

**BY HAND DELIVERY**

JAN 27 2003

Ms. Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 Twelfth Street, S.W., Room TW-B204  
Washington, D.C. 20554

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

**Re: Written-Ex Parte Presentation in ET Docket No. 98-153**

Dear Ms. Dortch:

Pursuant to Section 1.1206 of the Commission's Rules 47 C.F.R. § 1.1205, please find two copies of a January 27, 2003 written *ex parte* presentation enclosed for inclusion in the record of the above-referenced proceeding. The presentation, which was made on behalf of the 30 companies and associations identified in the letterhead of the enclosure hereto, was transmitted electronically and/or by hand to the office of Chairman Powell, the offices of Commissioners Abeinathy, Copps, Martin, and Adelstein, and to officials within the Commission's Office of Engineering and Technology. The list of recipients within the Commission is shown on page 7 of the enclosure.

Please direct any questions concerning this matter to the undersigned

Respectfully submitted,

  
Stephen D. Baruch

*Air Transport Association of America • American Airlines Inc. •  
American Medical Response • ARINC • AT&T Wireless Services •  
Deere & Co. • Delta Air Lines, Inc. • eRide, Inc. • Garmin International, Inc. •  
General Aviation Manufacturers Association • Global Locate, Inc. •  
Lockheed Martin Corporation • Multispectral Solutions, Inc. •  
National Business Aviation Association, Inc. • National Ocean Industries Association •  
NavCom Technology, Inc. • Nortel Networks, Inc. • Omnistar, Inc. •  
PanAmSat Corporation • QUALCOMM Incorporated • Raytheon Company •  
Rockwell Collins, Inc. • SiRF Technology, Inc. • Sinus Satellite Radio, Inc. •  
Spatial Technologies Industry Association • Sprint Corporation •  
Tendler Cellular, Inc. • Triton Navigation Ltd. • United Air Lines •  
United States GPS Industry Council*

January 27, 2003

The Honorable Michael Gallagher  
Deputy Assistant Secretary of Commerce for Communications  
And Information  
National Telecommunications and  
Information Administration (NTIA)  
Herbert Clark Hoover Building  
14<sup>th</sup> Street and Constitution Avenue, N.W.  
Washington, D.C. 20230

**Re: ET Docket No. 98-153 (FCC Ultra-Wideband Proceeding)**

Dear Mr. Gallagher:

The signatory companies and associations write to bring to your attention the technical and regulatory treatment being developed in Europe by CEPT for the potential introduction of Ultra-wideband (UWB) devices and networks into the European radio frequency spectrum. Although these CEPT emission limits have only recently been introduced into ITU-R studies, the CEPT approach evidences both prudence and support for introducing UWB technology. This approach protects public safety and a variety of commercial and government applications while preserving the potential of existing digital services and technologies to continue to innovate. We believe that this approach evinces a reasoned balance of important policy goals and should be of value and interest to NTIA in the ongoing intergovernmental discussions on the implementation and review of the regulatory approach to UWB adopted by the FCC last year.

The CEPT approach takes into account the technical and practical parameters of UWB technology while also recognizing the need to “offer more interference protection to critical sensitive services operating below 3.1 GHz” (e.g., they propose a slope mask and extending the -75 dBm/MHz at 1660 in a flat line below 960 MHz). See Attachment A. CEPT also concludes that UWB cannot fully use a staircase spectrum mask as developed by the FCC, and that an additional advantage of a slope mask is that such a mask does not reduce the performance of UWB products. Finally, we note that the proposed CEPT emission mask, in anticipation that 98% of UWB applications will be in communications

and measurement systems, provides greater protection to safety-of-life systems in frequencies at and below 1 GHz than does the mask adopted by the FCC.

We recognize that the CEPT approach to UWB remains under development, and acknowledge that it may not adequately address all concerns that existing radiocommunication services have with UWB technology in frequency bands between 3.1 GHz and 10.6 GHz. At the same time, however, we also recognize that CEPT has arrived at these conclusions through a deliberative process that focuses on the attributes and aptitudes of UWB technology. We believe that the CEPT slope mask, at least in its current iteration, is the right approach to take below 3.1 GHz, because it is fundamentally objective and avoids the pitfalls of a political debate conducted in an information vacuum. Further work on the CEPT approach may be required to adequately protect radiocommunication services in certain bands above 3.1 GHz. The U.S. and the world are just now beginning to climb the steep educational curve that is associated with the recent emergence of UWB technology, and there is not yet sufficient meaningful operational experience with actual UWB devices to fully understand how this technology affects existing technologies and systems. Until we can be certain that UWB applications will not interfere with safety-of-life systems, an objective approach that introduces new technologies without compromising safety or the ability of existing digital technologies and services to continue to innovate is what is needed.

*It would be most unfortunate for the United States, and particularly the FCC, under these circumstances, to use the pending reconsideration process in ET Docket No. 98-153 to relax the restrictions and emissions limits below 3.1 GHz.* The objective evidence to support the conclusion that such a change will not interfere with critical, safety-of-life systems and existing digital services has not been provided to the FCC. Consequently, we strongly urge no change in the existing UWB rules:

- No communications below 3.1 GHz (licensed/unlicensed; indoor/outdoor)
- No relaxation of existing emission limits, including GPS (-105 dBW/MHz)
- Protect the noise floor in the radiofrequency bands in the National Airspace (NAS)
- No expansion of eligibility below 3.1 GHz to use different categories of UWB devices

We note that several Canadian contributions submitted to the ITU-R Task Group I/8 recognize that the susceptibility threshold of several mobile communication services is comparable to the GPS receiver susceptibility baseline that the FCC used in developing the emission limits in the FCC First Report and Order. See Attachment B. Canada recognizes that the noise floor of these digital services needs protection at levels that preserve the ability of these service providers to continue to innovate and compete domestically as well as internationally. While Europe's balanced approach will ensure that the EU will reap maximum economic benefit from the ongoing digital innovation of all sectors, and including UWB, the U. S. may well find itself at a competitive disadvantage from raising the noise floor in all sectors of its digital services. We strongly encourage NTTA to reflect upon this development and take this into account in any decisions on UWB emission limits.

Finally, it is important to note that UWB emissions universally increase the noise floor for all applications: indoor, outdoors, the military, aviation, public safety (e.g. E911), commercial, and consumers. In particular, to adequately protect GPS applications, UWB emission limits should not be raised above the already established – 105.3dBW/MHz (-75.3dBm/MHz). This limit protects the CPS noise floor and is consistent with that derived by the GPS Joint Program Office (*see* Attachment C).

The consequences of this issue are far too important for the United States. In light of the extensive international activity begun by the ITU-R Task Group I/8, any attempts to modify the existing FCC limits below 3.1 GHz are, at a minimum premature.

Respectfully submitted,

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Enclosures: Attachment A: FCC UWB Emission Limits and Proposed CEPT  
Emission Mask For Communication and Measurement Systems  
(Indoor/Outdoor)  
Attachment B: Mobile System Parameters  
Attachment C: Noise Floor Analysis

cc (w/ encl.): Hon. Michael K. Powell, Chairman, FCC  
Hon. Kathleen Q. Abernathy, Commissioner, FCC  
Hon. Michael J. Copps, Commissioner, FCC  
Hon. Kevin J. Martin, Commissioner, FCC  
Hon. Jonathan S. Adelstein, Commissioner, FCC  
Ed Thomas, FCC Office of Engineering and Technology  
Julius Knapp, FCC Office of Engineering and Technology  
Karen Rackley, FCC Office of Engineering and Technology  
John Reed, FCC Office of Engineering and Technology  
Ron Chase, FCC Office of Engineering and Technology



## ATTACHMENT A

### FCC UWB EMISSION LIMITS AND PROPOSED CEPT EMISSION MASK FOR COMMUNICATION AND MEASUREMENT SYSTEMS (INDOORS) [Switzerland: 1-8/32-E]

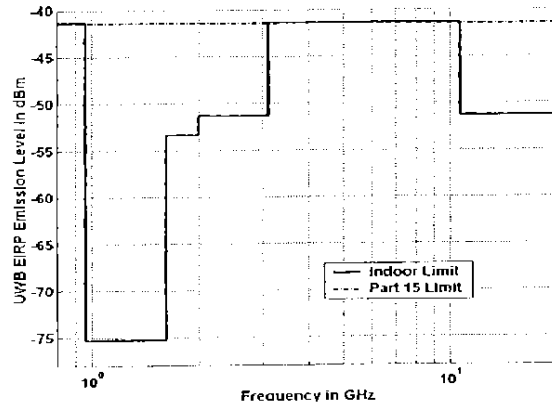


FIGURE 1

FCC UWB emissions limits for indoor communication and measurement systems. Units with center frequencies greater than 3.1 GHz

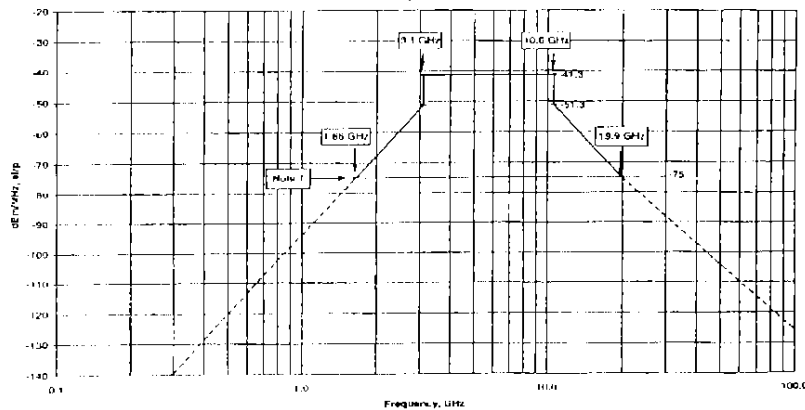


FIGURE 3  
Indoor CEPT  
slope mask

#### 3.3 Modified FCC Masks

The CEPT SE24 modified the new FCC UWB masks (s.3.2) below 960 MHz to a flat line by  $-75$  dBm/MHz. This modification was proposed in order to protect the numerous radiocommunication applications in Europe that are centered at frequencies below 1 GHz.

#### 3.4 Proposed CEPT slope mask

FCC issued a staircase spectrum mask limit for radiated power density. UWB cannot utilize the staircase mask fully and CEPT therefore proposes to use a sloped mask instead. The advantage of this mask is: a) a slope offers more interference protection to critical sensitive services operating below 3.1 GHz; b) a slope itself does not reduce the performance of UWB products. At low frequencies, an attenuation roll-off for the proposed mask meets FCC's requirement at 3.1 and 1.66 GHz with a radiated power density limits of  $-51.3$  dBm/MHz (indoors);  $-61$  dBm/MHz (outdoors) and  $-75$  dBm/MHz respectively.

## ATTACHMENT A (Continued)

### FCC UWB EMISSION LIMITS AND PROPOSED CEPT EMISSION MASK FOR COMMUNICATION AND MEASUREMENT SYSTEMS (OUTDOORS)

[Switzerland: 1-8/32-E]

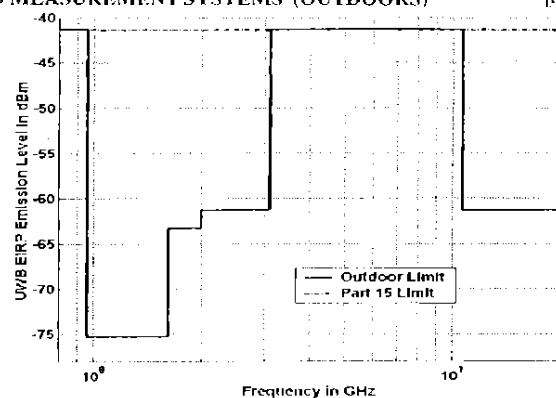


FIGURE 2

FCC UWB emissions limits for outdoor communication and measurement systems. Units with center frequencies greater than 3.1 GHz

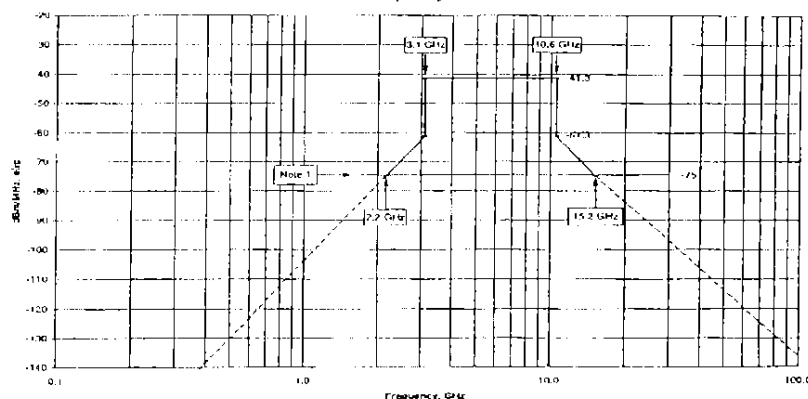


FIGURE 4  
Outdoor CEPT  
slope mask

#### 3.3 Modified FCC Masks

The CEPT SE24 modified the new FCC UWB masks (s.3.2) below 960 MHz to a flat line by  $-75$  dBm/MHz. This modification was proposed in order to protect the numerous radiocommunication applications in Europe that are centered at frequencies below 1 GHz.

#### 3.4 Proposed CEPT slope mask

FCC issued a staircase spectrum mask limit for radiated power density. UWB cannot utilize the staircase mask fully and CEPT therefore proposes to use a sloped mask instead. The advantage of this mask is: a) a slope offers more interference protection to critical sensitive services operating below 3.1 GHz and above 10.6 GHz; b) a slope itself does not reduce the performance of UWB products. At low frequencies, an attenuation roll-off for the proposed mask meets FCC's requirement at 3.1 and 10.6 GHz with a radiated power density limits of  $-51.3$  dBm/MHz (indoors);  $-61$  dBm/MHz (outdoors) and  $-75$  dBm/MHz respectively.

## ATTACHMENT B MOBILE SYSTEM PARAMETERS

1/19/03 Items	Source	Title	Additional Excerpts				
9	Canada 1-8/26-E	Proposed Text and Structure of A Recommendation and A Report on Compatibility Between Devices Using UWB Technology and Radiocommunication Services					
				Mobile System Parameters		(Page 8)	
			<u>System</u>	<u>Carrier Freq/MHz</u>	<u>Bandwidth</u>	<u>System Sensitivity</u>	<u>Sensitivity</u>
					(MHz)	(dBm)	(dBm)
			DECT	1880	1.728	-97	-99.4
			GSM	950	0.2	-108	-101
			CDMA-2000 1X	1900	1.25	-110	-111
			UMTS/WCDMA FDD	2100	3.84	-105	-110.8
11	Canada 1-8/33-E	Compatibility Between Receivers of the Mobile Communications Services and Emissions By UWB Devices					
				Mobile System Parameters		(Page 5)	
			<u>System</u>	<u>Carrier Freq/MHz</u>	<u>Bandwidth</u>	<u>System Sensitivity</u>	<u>Sensitivity</u>
					(MHz)	(dBm)	(dBm)
			DECT	1880	1.728	-97	-99.4
			GSM	950	0.2	-108	-101
			CDMA-2000 1X	1900	1.25	-110	-111
			UMTS/WCDMA FDD	2100	3.84	-105	-110.8
			GPS L1	1500	10		-117.5

## ATTACHMENT C NOISE FLOOR ANALYSIS

Thermal noise is the correct approach to accounting for noise factors because it includes both the ambient noise temperature and the receiver noise temperature. They interact with each other and not in a linear way. The receiver noise temperature softens the effect of the ambient noise and sometimes dominates. One of reasons for the higher ambient noise indoors is the fact that the antenna is looking at the warm walls, instead of the cold sky. Walls are 3 or more times warmer (in absolute temperature) than the sky, resulting in 4 to 5 dB more ambient noise.

The equation for  $N_0$  in FCC TRB report is not correct for the noise floor. The equation only describes “receiver” noise – it does not include ambient source noise. The correct equation for thermal noise density, in dBW/Hz is

$$N_0 \approx 10 \log_{10} \left[ kT_s + kT_0 (10^{NF} - 1) \right]$$

where  $T_s$  is the source temperature in K,  $k$  is Boltzman’s constant ( $1.38 \times 10^{-23}$  Watts/K-Hz),  $T_0$  is 290 K, and  $NF$  is the receiver noise figure in dB.<sup>1</sup> This source temperature is usually taken to be 100 K using an omni-directional antenna outdoors, accounting for ground clutter. This results in a source ambient thermal noise equal to -118.6 dBm/MHz. The source noise temperature would be 290 K indoors. When using a horn antenna such as was used in the FCC TRB report, pointed at the sky, the source temperature could be much lower because “ground clutter” is essentially eliminated. This explains ambient noise measured at -122 dBm/MHz. However, if the Sun is located in a narrow beam, the source temperature could be much higher.

For aviation applications, as derived by RTCA, a noise figure of about 4 dB is used as typical for including pre-filtering and lightning protection losses, thus the noise density (-111.5 dBm/MHz) is 7.1 dB higher than the ambient source noise density.

One might argue that for indoor and outdoor handheld or automotive GPS receivers, a lower noise figure is possible due to less stringent protection requirements than aviation. However, indoors, the lower noise figure is offset by a higher source temperature. An increase in source temperature of 2.9 (290 K instead of 100K) would require the noise figure to be reduced to 1.82 to achieve the same overall thermal density. This is quite low, so the conclusion is that the assumed noise density (-111.5 dBm/MHz) is universal.

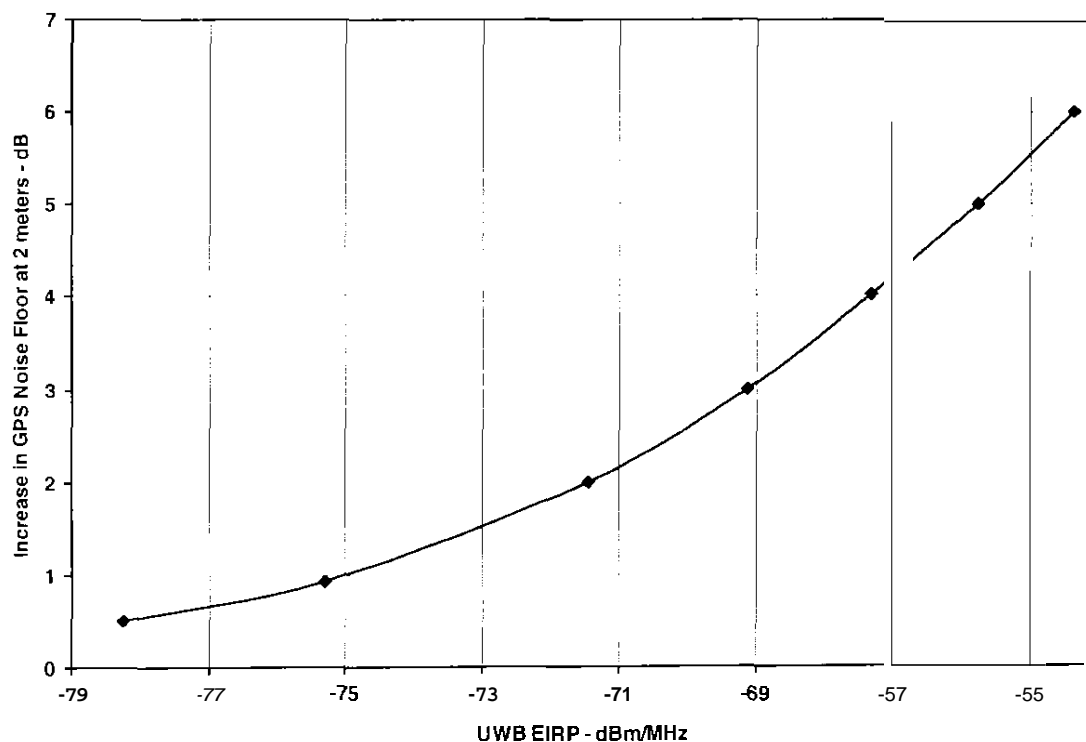
The above equation does not include ambient radio noise (interference). The total noise density, including this interference (such as UWB emissions), is

$$N_{0 \text{ total}} \approx 10 \log_{10} \left[ kT_s + kT_0 (10^{NF} - 1) + 10^{IN_i} \right]$$

<sup>1</sup> B. W. Parkinson and J. J. Spilker, Jr., Editors, Global Positioning System: Theory and Applications I, Chapter 8, pp. 343-344, AIAA, 1996.

**ATTACHMENT C**  
**NOISE FLOOR ANALYSIS**  
(Continued)

where  $N_I$  is the interference noise density in dBW/Hz. To have a negligible impact, this interference noise density should be 6 dB less than the -111.5 dBm/MHz thermal noise density. Obviously, at 2 meters distance, the overall noise floor will be raised (about 1 dB for the NPRM emission level of -75.3 dBm/MHz). Figure 1 shows the increase in noise floor as a function of emission level. This increase in noise floor is consistent with that derived by the GPS Joint Program Office



**Figure 1. Rise in Noise Floor as a Function of UWB Emission Limit**

It is also important to note that this degradation in noise floor does not just apply to the GPS C/A Code. The same degradation also applies to the GPS military P Code.

We can only conclude that UWB emissions universally increases the noise floor for all GPS applications – indoors, outdoors and aviation – and conclude that the UWB emission limits cannot be raised above the already established -105.3 dBW/MHz limit.